Salud, Ciencia y Tecnología. 2024; 4:.1361
doi: 10.56294/saludcyt2024.1361

ORIGINAL

Nurses' Knowledge, Skills, and Attitudes Regarding Climate Change and Its Impact on Children's Health in Egyptian Hospitals: A Comparative Study

Conocimientos, habilidades y actitudes de las enfermeras respecto del cambio climático y su impacto en la salud infantil en hospitales egipcios: un estudio comparativo

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Cite as: Sayed Abdelaziz F, Elzeiny A, Mahdy Fouda N, Hameed Shahin MA, Husni Alabed H, Loutfy A. Nurses' Knowledge, Skills, and Attitudes Regarding Climate Change and Its Impact on Children's Health in Egyptian Hospitals: A Comparative Study. Salud, Ciencia y Tecnología. 2024; 4:.1361. https://doi.org/10.56294/saludcyt2024.1361

Submitted: 09-03-2024 **Revised:** 01-06-2024 **Accepted:** 27-08-2024 **Published:** 28-08-2024

Editor: Dr. William Castillo-González

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ABSTRACT

Introduction: pediatric nurses are believed to play a crucial role in mitigating and adapting to the impacts of climate change on children's health. Consequently, this study aims to compare nurses' knowledge, skills, and attitudes regarding climate change and its effects on children from hospitals in two provinces in Egypt.
Methods: a cross-sectional comparative study was conducted involving staff nurses working in different pediatric units in hospitals across two provinces in Egypt. A total of 336 nurses were purposively selected as participants. Data collection utilized three tools: a designed structured questionnaire for knowledge, a climate health skills rating scale, and an attitude scale.
Results: in Beni-Suef hospitals, a significant proportion of participants exhibited poor knowledge, skills, and attitudes (48,2 %, 50,6 %, and 54,2 %, respectively). In contrast, most participants in Al Azhar hospitals demonstrated good knowledge, skills, and attitudes regarding climate change (69,6 %, 29,2 %, and 82,1 %, respectively). These differences between the two provinces were highly statistically significant (P = 0.001).
Conclusion: nurses at Al Azhar Hospital exhibited higher levels of knowledge, skills, and attitudes regarding climate change compared to their counterparts at Beni-Suef Hospital.

Keywords: Climate Change; Nurses; Knowledge; Skills; Attitudes; Children.

RESUMEN

Introducción: se cree que las enfermeras pediátricas desempeñan un papel crucial en la mitigación y adaptación a los impactos del cambio climático en la salud de los niños. En consecuencia, este estudio tiene como objetivo comparar los conocimientos, habilidades y actitudes de las enfermeras con respecto al cambio climático y sus efectos en los niños de los hospitales de dos provincias de Egipto.
Métodos: se realizó un estudio comparativo transversal que involucró a enfermeras de plantilla que trabajaban en diferentes unidades pediátricas en hospitales de dos provincias de Egipto. Se seleccionó deliberadamente a un total de 336 enfermeras como participantes. La recopilación de datos utilizó tres herramientas:

un cuestionario estructurado diseñado para el conocimiento, una escala de calificación de habilidades de salud climática y una escala de actitudes.
Resultados: en los hospitales de Beni-Suef, una proporción significativa de participantes exhibió conocimientos, habilidades y actitudes deficientes (48,2 %, 50,6 % y 54,2 %, respectivamente). En cambio, la mayoría de los participantes de los hospitales de Al Azhar demostraron buenos conocimientos, habilidades y actitudes con respecto al cambio climático (69,6 %, 29,2 % y 82,1 %, respectivamente). Estas diferencias entre las dos provincias fueron estadísticamente muy significativas (P = 0,001).
Conclusión: las enfermeras del Hospital de Al Azhar mostraron mayores niveles de conocimientos, habilidades y actitudes con respecto al cambio climático en comparación con sus contrapartes del Hospital Beni-Suef.

Palabras clave: Cambio Climático; Enfermeras; Conocimientos; Habilidades; Actitudes; Niños.

INTRODUCTION

Climate change emerges as the foremost threat to global health in the current century, and its impacts are palpable across children's lifetimes.[1,2] This phenomenon, denoting a discernible shift in weather patterns, stems directly from human interventions in the Earth's atmosphere, primarily the escalating concentrations of greenhouse gases worldwide. Effectively combatting climate change and safeguarding public health necessitate concerted efforts to curtail greenhouse gas emissions, achievable only through international collaboration and a commitment to both mitigation and adaptation measures.[3,4]

Children, the most vulnerable demographic in society, bear the brunt of climate change's adverse effects on health. This injustice transcends generations, with climate change emerging as the most significant threat children face today.[5] Particularly susceptible during infancy and childhood, children experience heightened sensitivity to environmental conditions.[6] Regardless of residing in urban or rural settings, children face health risks from both toxic substances and climate change in their living, learning, and playing environments.[7] Despite contributing minimally to climate change, children suffer disproportionately from its consequences, with impacts extending to essential elements like clean air, potable water, nutritious food, and secure surroundings.[8,9]

The health impacts of climate change on children, as identified by the US Climate and Health Assessment, encompass malnutrition, insect-borne illnesses, diarrheal illnesses, heat stress, depression, anxiety disorders, and air pollution-related diseases. These factors collectively contribute to heightened mortality and morbidity rates among children.[10,11] Concurrently, climate change and environmental degradation pose significant obstacles to upholding children's rights, impeding their ability to grow up in a safe and secure environment.[12]

Global statistics from the World Health Organization reveal that a staggering 93 % of children under fifty, approximately 1,8 billion, breathe extremely polluted air, endangering their health, growth, and development. Air pollution alone contributes to 20 % of newborn deaths globally.[13] Moreover, approximately 800 million children worldwide contend with elevated blood lead levels, with one in three children surpassing five micrograms. Childhood lead exposure correlates with stunted growth, diminished IQ, attention problems, and learning difficulties.[14] Environmental factors contribute to 80 % of disorders, with efforts to mitigate environmental hazards potentially preventing 26 % of deaths in children under five.[7]

The surge in air and environmental toxins coincides with an increased prevalence of malignancies, diabetes, neurological diseases, and bronchial asthma in children globally.[15,16] Notably, up to 500 million children face an elevated risk of flooding, while 160 million are similarly affected by drought. Projections indicate that over half a billion children will inhabit regions experiencing extreme water stress by 2040.[17] Environmental degradation in the Arab region alone is attributed to 420,000 premature deaths, constituting 20 % of total fatalities.[18] Developing nations bear the brunt, with 92 % of pollution-related deaths occurring in these regions.[19,20] Predictably, between 2030 and 2050, an additional 250 000 deaths annually are anticipated due to climate change-related causes, with direct health impact costs projected to double from $2 billion in 2015 to $4 billion in 2030.[18,21]

Egypt serves as a poignant example of a country highly susceptible to climate change, facing risks to economic, health, and environmental sustainability.[22] The country's low ranking of 94th in the 2020 Environmental Performance Index underscores these vulnerabilities.[23] In Egypt's capital, Cairo, air pollution alone is linked to an alarming annual premature death toll of 12,600 cases, accounting for 59 % of total deaths.[24,25] The associated health and economic costs are staggering, with estimates reaching 12569 deaths and an annual healthcare burden of 45-48 billion pounds, equivalent to 1,3-1,4 % of the GDP in 2016/2017.[22]

The impact of inadequate drinking water in Egypt is equally stark, with patients spending an average of 2,8 billion days in hospitals due to water-related diseases. Deaths attributable to water unavailability and diarrheal diseases further compound the public health crisis, with associated costs reaching an estimated 39 billion annually.[26] Coastal areas, home to a mere one-fifteenth of Egypt's population, are projected to face severe

flooding, necessitating relocation and exposing residents to emotional trauma, mold development, and other physical risks associated with extreme weather.[10,24]

Nurses, positioned uniquely within the healthcare system, play a pivotal role in identifying climate change threats to children's health and at-risk children. Their integral role in enhancing children's health and well-being necessitates an understanding of the health problems linked to climate change.[27,28] As frontline healthcare providers, nurses are crucial in analyzing and preparing for local impacts on children's health due to climate change-related disasters.[29,30]

Possessing a powerful voice in society and healthcare, nurses can initiate immediate change by implementing sustainability practices.[31,32] Pediatric nurses, in particular, can mitigate the adverse effects of climate change by providing proactive information to parents and children, joining green teams, and contributing to environmentally friendly practices within healthcare settings.[33,34] Aligning with Goal No. 3 of the United Nations' 17 Sustainable Development Goals, nurses contribute significantly to ensuring healthy lives and well-being for all people by 2030. Addressing the burden of disease related to the environment becomes paramount as environmental exposure increasingly impacts children's health in the context of climate change and biodiversity loss.[4,23]

Significance of the Study

Egypt stands out as one of the nations most susceptible to the repercussions of climate change, as attested by individual countries reporting to the UN Convention on Climate Change. The report highlights that both current and future climatic conditions pose a significant environmental threat, challenging Egypt's developmental trajectory and adversely impacting the health of its population, particularly children.[22] While climate change is a globally recognized issue, there is a paucity of research exploring the role of nurses in ameliorating the adverse effects on Egyptian children. Existing literature reveals that a lack of awareness and misconceptions among nurses about climate change contribute to delayed recognition of its health effects on children, resulting in increased mortality and morbidity. Given the heightened vulnerability of children to climate change risks, the study's significance is unquestionable. Consequently, this research aimed to compare nurses' knowledge, skills, and attitudes regarding climate change and its effects on children from hospitals in two provinces in Egypt.

METHOD

Study Design

This study employed a cross-sectional comparative research design to address the following questions:

- What is the extent of nurses' knowledge regarding the health implications and their role in mitigating the adverse effects of climate change on children?
- What are the skills and attitudes of nurses concerning climate change?

Study Setting

The study took place in two provinces of Egypt, namely Cairo City and Beni-Suef City, encompassing various pediatric units such as the neonatal intensive care unit, pediatric intensive care unit, pediatric medical department, and pediatric outpatient clinic. In Cairo City, data was collected from three hospitals: Bab El Shaareya University Hospital, Al Hussein University Hospital, and Al Zahraa University Hospital, all situated in the center of Cairo City and affiliated with Al Azhar Institution. These hospitals serve as teaching and unpaid hospitals for all departments, providing comprehensive healthcare services for children. Another set of data was obtained from Beni-Suef hospitals, including Beni-Suef University Hospital, Beni-Suef General Hospital, and Health Insurance Hospital located in the center of Beni-Suef City. These governmental hospitals offer free health services for both urban and rural areas, ensuring children receive full medical care. The study sample was graphically chosen from hospitals in two provinces of Egypt (Cairo City and Beni-Suef City). These hospitals were selected based on the caliber of health interventions offered, accessibility, and approval to participate in the study.

Subjects and Sampling Procedure

A purposive sample comprised of staff nurses employed full-time as nursing care providers in the previously mentioned settings. The participants were divided into two groups: the first group from Al Azhar Hospitals, consisting of 168 nurses, and the second group from Beni-Suef Hospitals, also comprising 168 nurses. The total sample size was 336 nurses from both groups. The inclusion criteria included nurses working in pediatric units with a minimum of six months of experience and agreed to join the study. The exclusion criteria encompassed nurses who were not present when the data was gathered or those who did not agree to join the study.

Sampling procedure

The sample size was computed using the equation to determine the intended size:

$$\text{Sample equation} = \frac{N \times p(1-p)}{[N-1 \times (d2 \div Z2)] + P(1-P)}$$

Finally, 336 nurses representing two distinct provinces.

Study Tools

Drawing from recent relevant research and literature, the authors developed study tools designed to simplify comprehension for nurses. The questionnaire, initially crafted in their native language, was subsequently translated into English.

Tool (I): Structured Questionnaire for knowledge

It comprises four sections:

1. Demographic datasheet: this section delves into key demographic details of the nurses, including age, sex, education, years of experience in the pediatric unit, and participation in courses or symposiums related to climate change.

2. Nurses' Knowledge about Climate Change: this segment, developed by the authors with reference to the World Health Organization,[18] encompassed nine true and false questions exploring the meaning of climate change, its causes, high-risk groups, and associated factors.

3. Health Implications of Climate Change on Children: crafted by the researchers based on Felicilda-Reynaldo et al.[19] this section involved 15 true and false questions regarding waterborne diseases, air pollution-related illnesses, vector-borne diseases, foodborne diseases, malnutrition, heat and cold-related illnesses, mental health changes, physical injuries due to natural disasters, interference with medical facilities during extreme weather conditions, and increased violence and felony due to lifestyle and personality changes.

4. Role of Nurses Regarding Climate Change: developed by the authors using guidelines from Nurses and Nurse Practitioners of British Columbia,[34] this section included five true and false questions addressing topics such as establishing green teams in the workplace, promoting smart and healthy climates, educating parents about climate change and sustainability, participating in multi-sector climate action plans, preparing for emerging demands, and providing health interventions for the impact of climate change on children. Each correct response earns one point, while incorrect or unanswered questions receive zero points. The mean of the total score of the questionnaire determines knowledge classification as either a good level (≥80 %) or a poor level (<80 %).

Tool (II): Climate Health Skills Rating Scale

Developed by the authors drawing on Alvarez-Garcia et al.[35] this scale assessed nurses' climate change skills through 12 items rated on a five-point Likert scale (1 to 5). The highest possible score is 60 points, with skill levels categorized as follows: excellent (85 %-100 %), very good (70 % < 85 %), good (55 % < 70 %), insufficient (50 < 55 %), and poor (<50 %).

Tool (III): Nurses' Attitude About Climate Change

Formulated by the authors based on the work of Deveci et al.[36] this tool measures nurses' attitudes toward climate change. It consists of nine sentences rated on a five-point Likert scale (1 for strongly disagreeing to 5 for strongly agreeing), with a maximum score of 45 marks. Attitudes are categorized as negative (<60 %), or positive (≥60 %).

Validity, reliability and pilot study:

- A committee of seven experts in pediatric nursing ensured content validity and reviewed the tools for completeness, accuracy, phrasing, duration, structure, and overall appearance. Tools were modified based on the panel's feedback. Internal reliability, assessed using Cronbach's alpha, yielded values of 0,86 for the knowledge sheet, 0,94 for climate health skills, and 0,93 for attitude toward climate change.
- A pilot study involving 34 nurses (10 % of the sample) from Beni-Suef and Al Azhar Hospitals informed adjustments to the study tool, including reframing, reordering, deleting, and adding certain questions based on the pilot study's results, however, the participants in the piloting were excluded from the final report of the study.

Ethical Approval

The protocol received approval from the Research Ethical Committee of Beni-Suef University (Approval No: FMBSUREC/06112022). All methods adhered to the 1964 Helsinki Statement and the ethical rules of the

university's national review panel. Nurses interested in participating signed informed written permission forms. The anonymity and confidentiality of participants were rigorously maintained, with all information securely stored on the corresponding author's computer. Participants were assured of complete autonomy to join the study voluntarily, free from coercion or expectation of reimbursement. Moreover, they retained the freedom to withdraw from the study at any point without the need to provide reasons.

Procedure

The authors liaised with study subjects who met the inclusion criteria and expressed willingness to participate in the study at their workplace. To facilitate data collection, a comprehensive description of the study's nature and objectives was provided. Subsequently, data collection occurred during both morning and afternoon shifts, with each participant dedicating approximately 30 minutes to complete the questionnaire sheets. The data-gathering phase spanned three consecutive months, commencing in February 2023 and concluding in July 2023.

Statistical Analysis

The IBM SPSS software package, version 25, was employed for data input and analysis. Quantitative data were described in terms of mean, standard deviation, and variance. The significance of the findings was determined at the 5 % level. To explore interrelationships among quantitative variables, correlation coefficients (r) were calculated. Additionally, the t-test was employed for between-group comparisons.

RESULTS

In the context of the study's findings, table 1 compares demographic factors among pediatric nurses at Al Azhar and Beni-Suef hospitals. The total number in the study comprised 336 nurses, equally distributed between the two hospitals. Participants' ages ranged from 31 to 40 years. Regarding education, 45,8 % at Al Azhar hospitals and 50,6 % at Beni-Suef hospitals held technical institute degrees, with ≥10 years of experience (54,2 % & 49,4 %, respectively). Notably, a majority of nurses lacked climate change training—60,7 % at Al Azhar hospitals and 70,2 % at Beni-Suef hospitals. Significant differences in age, education, experience, and training were observed between pediatric nurses at Al Azhar and Beni-Suef hospitals (p < 0,001).

Table 1. Comparison of the demographic factors of the nurses (N=336)

	Al azhar Hospitals (n=168)		Beni-Suef Hospital (n=168)		Chi-Square	
Age /years	**N**	**%**	**N**	**%**	**X2**	**P- value**
20-30	33	19,6	55	32,7	131,34	0,000**
31-40	91	54,2	73	43,5		
<41	44	26,2	40	23,8		
Mean ±SD	39,398±10,176		34,76±8,299			
Educational level						
Diploma	71	42,3	33	19,6	110,281	0,000**
Institute	77	45,8	85	50,6		
Bachelor	20	11,9	50	29,8		
Nurses' experience in the pediatric setting						
1<5 years	33	19,6	46	27,4	149,011	0,000**
5<10 years	44	26,2	39	23,2		
≥10 years	91	54,2	83	49,4		
Joining any symposium or training course about climate changes						
Yes	66	39,3	50	29,8	123,90	0,000**
No	102	60,7	118	70,2		

Chi-square test p significant at ≤ 0,001**

The comparison of pediatric nurses' knowledge about the health implications of climate change on children is detailed in table 2. This section outlines the T-test results and mean scores. The total mean score for Al Azhar hospitals was 12,01 ± 4,748, surpassing that of Beni-Suef hospitals (10,15 ± 5,299), with a t-test result of 8,373 and a significant P-value of 0,000. The highest mean score was attributed to waterborne diseases causing gastrointestinal and respiratory issues (0,90 ± 0,302 at Al Azhar Hospital), while the lowest mean score pertained to earthquakes and volcanoes causing physical injuries (0,57 ± 0,497 at Beni-Suef hospitals). Highly

statistically significant differences were observed in all aspects of knowledge about the impact of climate change on children's health between the two groups of nurses (P-value < 0,001).

Table 2. Comparison of the pediatric nurses' knowledge about health implications of climate change on children

	Al Azhar Hospitals (n= 168)	Beni-Suef Hospital (n= 168)	T- Test	
	Mean ± SD	Mean ± SD	t	P value
1. Waterborne diseases lead to gastrointestinal diseases diarrhea and vomiting	0,90±0,302	0,80±0,403	4,336	0,000**
2. Lack of water availability leads to water stress and decreases the quantity and quality of water	0,74±0,441	0,67±0,473	3,584	0,000**
3. Vector-borne diseases lead to dengue and malaria	0,70±0,461	0,60±0,492	4,336	0,000**
4. Food-borne disease leads to food poisoning	0,73±0,444	0,65±0,477	3,743	0,000**
5. Decrease food production leads to changes to diet and malnutrition	0,80±0,403	0,70±0,461	4,336	0,000**
6. Air pollution leads to respiratory diseases such as asthma and allergic reactions	0,90±0,302	0,80±0,403	4,336	0,000**
7. Drought and Bushfires effect on environment contamination	0,77 ±0,423	0,65±0,477	3,373	0,001**
8. Physical injuries due to earthquakes and volcanoes that damaged infrastructure	0,68±0,466	0,57±0,497	4,502	0,000**
9. Heat-related illness	0,80±0,403	0,60±0,492	6,509	0,000**
10. Cold-related illness	0,86±0,351	0,60±0,492	7,698	0,000**
11. Interference of medical facilities due to extreme weather conditions	0,82±0,3840	0,76±0,4270	3,251	0,000**
12. Mental health condition changes lead to traumatic stress and anxiety disorders	0,80. ±0,403	0,70±0,461	4,336	0,000**
13. Emotional pain and relocation due to floods linked to home loss	0,74 ±0,441	0,60 ±0,492	4,070	0,000**
14. Deterioration of health conditions and increased violence and felony due to lifestyle and personality changes	0,89 ±0,310	0,70±0,459	5,182	0,000**
15. Skin cancer, melanoma, and eye disease due to UV exposure	0,82 ±0,384	0,67±0,473	4,322	0,000**
Total score	12,01±4,748	10,15±5,299	8,373	0,000**

Independent sample t-test p-value at ≤ 0,001**

Table 3. Comparison of the pediatric nurses' knowledge about their role in climate changes

	Al Azhar hospitals	Beni-Suef hospital	T- Test	
	Mean ± SD	Mean ± SD	T	P value
1. Establish a green team at the workplace and use smart healthy climate	0,57±0,4960	0,39±0,490	6,025	0,000**
2. Parent education about climate change and encouragement of sustainability	0,48±0,501	0,29±0,456	6,269	0,000**
3. Participation with multi-sector in climate action plan	0,69±0,464	0,49±0,501	6,389	0,000**
4. Make a plan for emerging demands and prepare parents for possible climate change crises	0,67±0,471	0,39±0,490	8,054	0,000**
5. Provide health intervention for the impact of climate change on children's health	0,77±0,420	0,60±0,492	6,025	0,000**
Total score	3,19±2,085	2,17±2,180	9,014	0,000**

Independent sample t-test p-value at ≤ 0,001**

Table 3 presents the mean scores of studied nurses' knowledge concerning their role in climate change. The mean score was 3,19 ± 2,085 and 2,17 ± 2,180 for Al Azhar and Beni-Suef hospitals, respectively. The mean score for providing health intervention for the impact of climate change on children's health at Al Azhar hospitals was 0,77 ± 0,420, compared to 0,60 ± 0,492 at Beni-Suef Hospitals, and was the highest for both groups. There was a highly statistically significant difference between the two groups of nurses in all items (P ≤ 0,001).

Figure 1 depicts the percentage distribution of the two studied groups of nurses based on their total knowledge about climate change; 69,6 % of the studied nurses at Al Azhar hospitals demonstrated a good level of knowledge, whereas 48,2 % of those at Beni-Suef hospitals exhibited a poor level of knowledge regarding climate change.

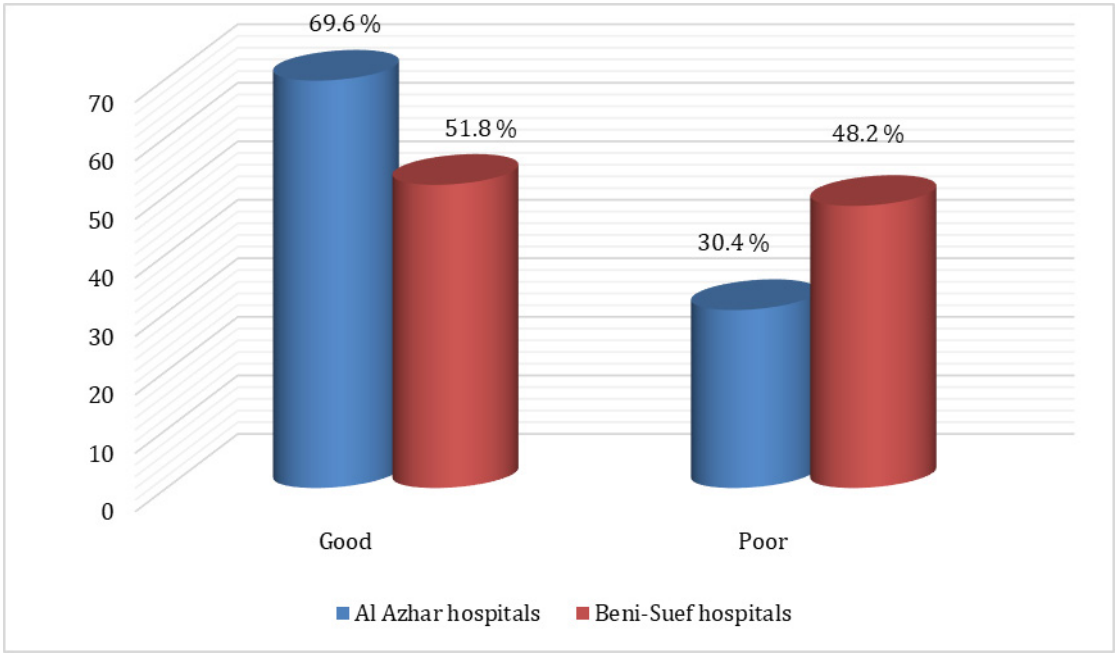

Figure 1. Total knowledge about climate change

Figure 2 illustrates climate health skills among the two groups of studied nurses. At Al Azhar hospitals, 29,2 % and 22,6 % of nurses had excellent and very good skills, respectively, while 50,6 % at Beni-Suef hospitals possessed poor skills regarding climate change.

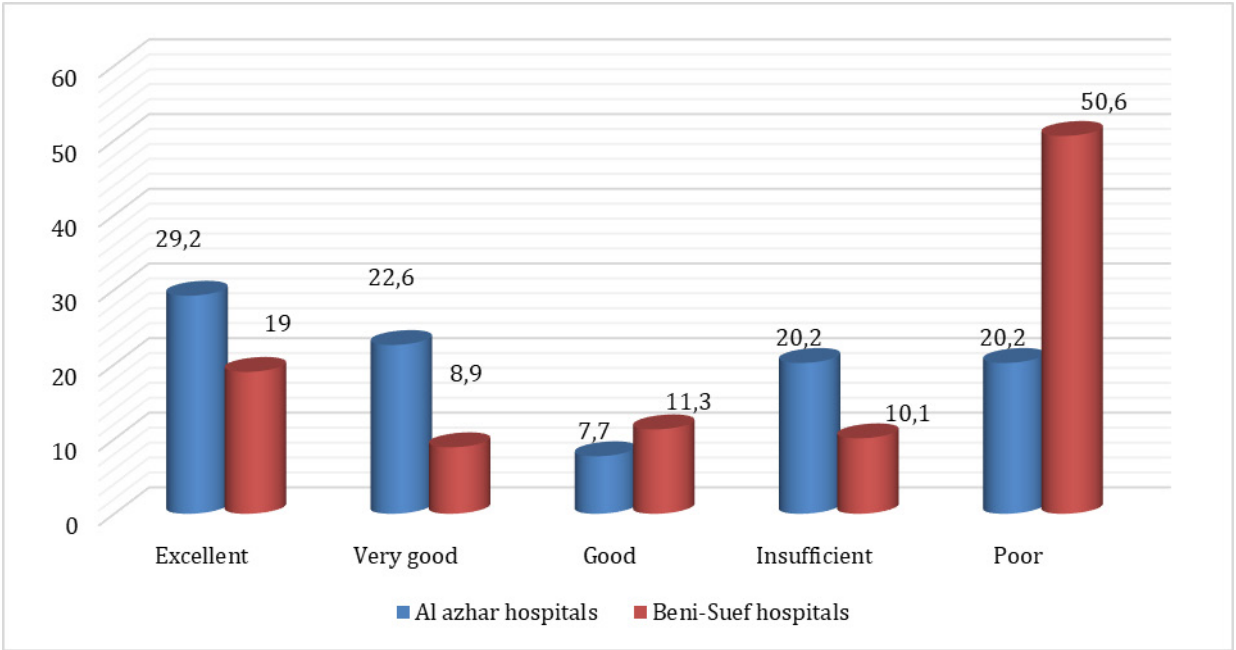

Figure 2. Climate Health Skills Scale

https://doi.org/10.56294/saludcyt2024.1361

Figure 3 illustrates the percentage distribution of the studied two groups of nurses based on their total attitude regarding climate change. A total of 82,1 % of the studied nurses at Al Azhar hospitals expressed a positive attitude, while 54,2 % at Beni-Suef hospitals had negative attitudes regarding climate change.

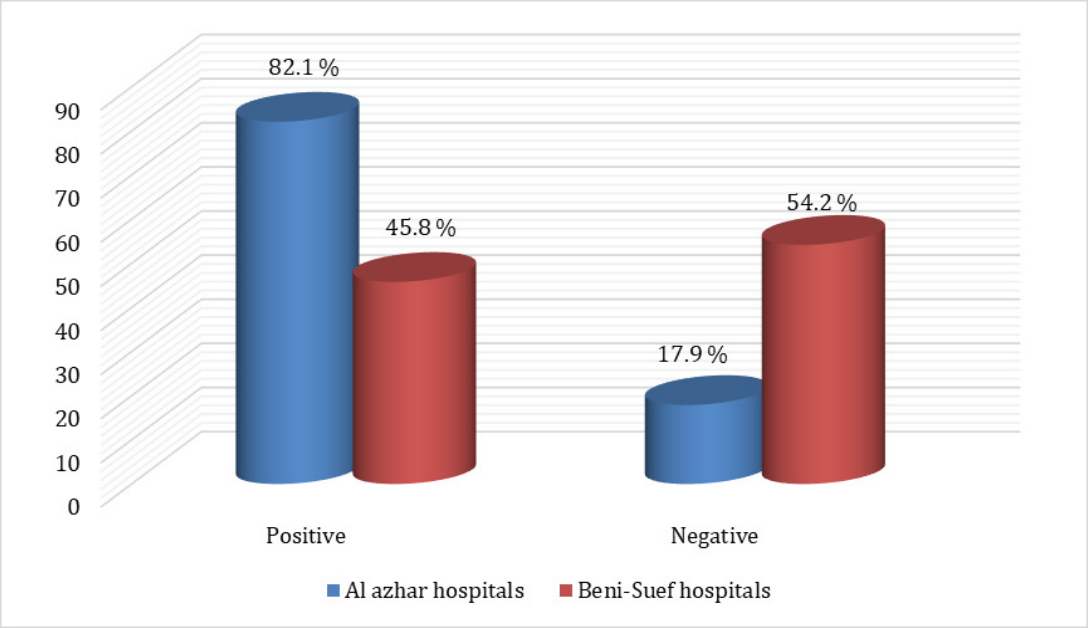

Figure 3. Total attitude regarding climate change

According to Figure 4, nurses' knowledge strongly correlates with skills at Al Azhar hospitals, determined by Pearson's coefficient test (0,803) with a significance level of < 0,001. This correlation implies that knowledge is essential for greater proficiency and enhanced skills.

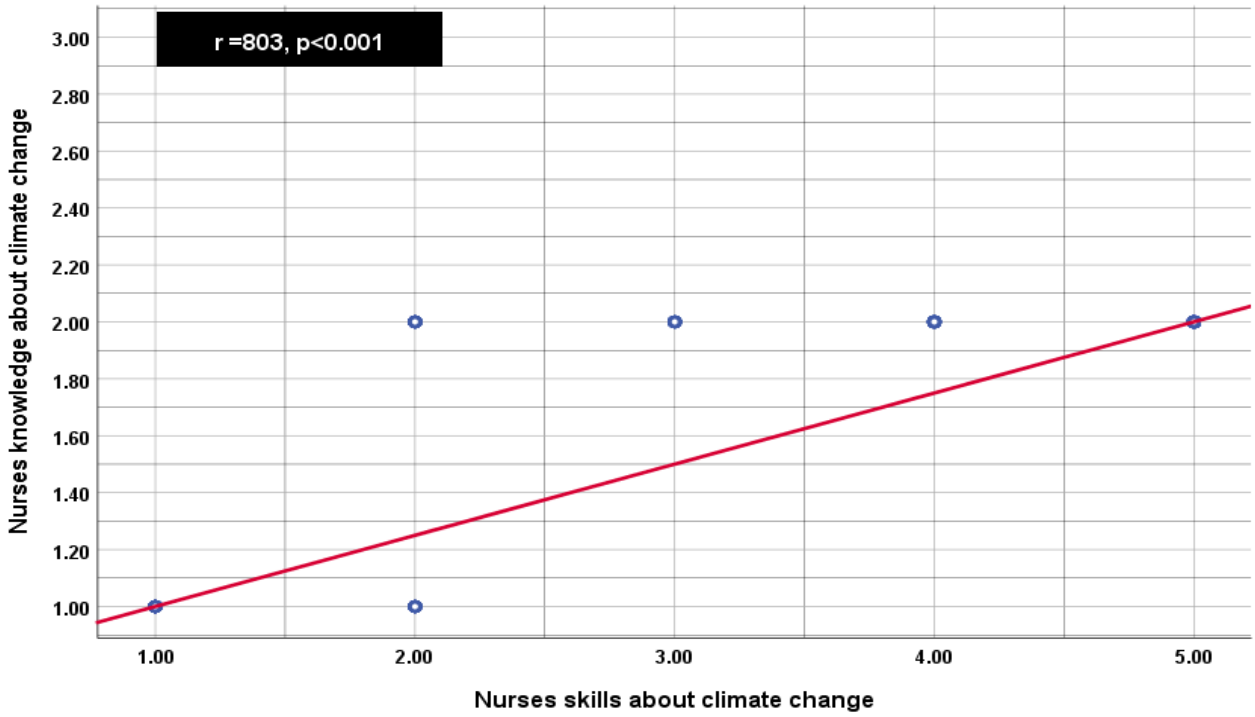

Figure 4. Correlation between knowledge and skills of the nurses regarding climate changes Al Azhar hospitals

Figure 5 demonstrates a positive correlation between knowledge and skills at Beni-Suef hospitals, with a correlational value of 0,858 and a degree of significance at < 0,001.

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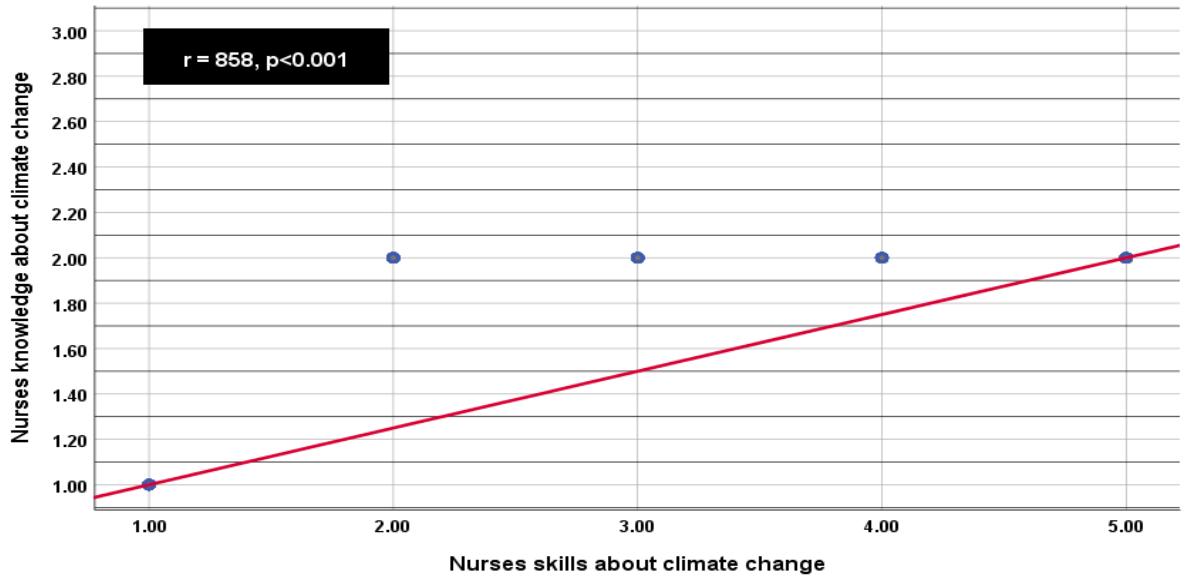

Figure 5. Correlation between knowledge and skills of the nurses regarding climate changes Beni-Suef hospital

The t-test results presented in table 4 indicated highly statistically significant differences in the knowledge, skills, and attitudes of pediatric nurses at Al Azhar hospitals and Beni-Suef hospitals concerning education, experience, and training courses (P < 0,05). Additionally, there were significant differences in the knowledge, skills, and attitudes of nurses specifically related to their age at Beni-Suef Hospitals. These findings emphasize the substantial impact of these factors on the knowledge, skills, and attitudes of nurses.

Table 4. Association between demographic factors of the nurses and knowledge, skills & attitude regarding climate change and its effect on children

Variable	Knowledge		Skills		Attitude	
	Al Azhar hospitals	Beni -Suef hospitals	Al Azhar hospitals	Beni- Suef hospitals	Al Azhar hospitals	Beni -Suef hospitals
Age /years	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
20-30	1,6±0,5	1,2±0,4	3,0±1,5	1,6±1,3	1,7±0,4	1,2±0,4
31-40	1,7±0,4	1,5±0,5	3,3±1,6	2,4±1,5	1,8±0,3	1,6±0,5
<41	1,727±0,4	1,7±0,5	3,2±1,5	3,2±1,7	1,8±0,4	1,7±0,5
F[p]	0,789[0,452]	11,621[0,000]	0,359[0,699]	29,517[0,000]	0,184[0,832]	11,621[0,000]
Educational level						
Diploma	1,718±0,4	1,3±0,4	3,3±1,6	1,7±1,3	1,8±0,3	1,3±0,4
Institute	1,610±0,5	1,5±0,5	2,9±1,5	2,1±1,4	1,7±0,4	1,5±0,5
Bachelor	1,950±0,2	1,7±0,5	4,1±1,2	3,1±1,7	1,9±0,2	1,7±0,5
F[p]	4,637[0,011]	7,250[0,001]	11,520[0,007]	24,285[0,000]	2,076[0,012]	7,250[0,001]
Experience						
1<5 yrs	1,5±0,5	1,3±0,5	2,5±1,5	1,8±1,3	1,7±0,4	1,3±0,4
5<10 yrs	1,5±0,5	1,5±0,5	2,5±1,3	2,16±1,5	1,6±0,5	1,4±0,5
≥10 years	1,8±0,4	1,8±0,4	3,8±1,4	3,5±1,7	1,9±0,2	1,8±0,4
F[p]	4,520[0,000]	10,290[0,000]	17,301[0,000]	15,878[0,000]	14,423[0,000]	10,290[0,000]
Training course						
Yes	1,7±0,4	1,4±0,5	3,4±1,5	2,1±1,5	1,9±0,3	1,4±0,5
No	1,6±0,5	1,7±04	2,8±1,4	2,9±1,6	1,7±0,4	1,7±0,4
F[p]	4,255[0,041]	10,336[0,002]	6,990[0,009]	8,502[0,004]	6,756[0,010]	10,336[0,002]

F is the analysis of variance (ANOVA), [p] is the p-value

https://doi.org/10.56294/saludcyt2024.1361

DISCUSSION

Pediatric nurses play a vital role in addressing the health implications of climate change, contributing significantly to the well-being of vulnerable members of society. In the context of climate change, children are identified as particularly susceptible to health issues.[32]

Examining the years of experience among the studied nurses, the research indicates a high percentage with over ten years of experience in both groups. The author posits that this is likely due to the majority of the study sample being senior nurses over 30 years old, aligning with Polivka et al.[37] findings that more than one-third of nurses have over ten years of experience. This contrasts with Xiao et al.[28] who reported that over two-quarters of nurses had less than three years of work experience. The divergence in findings emphasizes the need for further exploration. Regarding participation in training courses or symposiums on climate change, the study reveals that a majority in both groups did not attend such sessions. This observation suggests a potential gap in in-service training courses and hospital workshops addressing climate change, requiring attention from medical and nursing authorities. La Torre et al.[1] reported contrasting findings, noting that most studied subjects participated in courses related to climate change, highlighting a discrepancy that warrants consideration. The study's core research questions focus on assessing nurses' knowledge, skills, and attitudes regarding climate change. In evaluating nurses' knowledge about the health implications of climate change on children, the study found a significantly higher mean score for the Al Azhar hospitals group compared to the Beni-Suef hospitals group ($P < 0,001$). This distinction may be attributed to the location of Al Azhar hospitals in Cairo, where nurses face more health problems related to climate change, air pollution, and urbanization, in contrast to Beni-Suef, a smaller rural town where nurses may be less concerned about such impacts. This finding aligns with Byron et al.[29] indication that a large percentage of studied nurses exhibit a higher awareness of the health problems associated with climate change. Analyzing differences between the two groups, the study revealed a statistically significant difference in all mean scores based on nurses' roles in addressing climate change (P value of 0,001). Notably, the mean score for providing health interventions for the impact of climate change on children's health at Al Azhar hospitals was 0,77±0,420, while at Beni-Suef hospitals, it was 0,60±0,492. This finding supports the literature, such as that by Nurses and Nurse Practitioners of British Columbia,[34] which emphasizes the crucial role of nurses in establishing strategies for treating and providing health interventions for patients vulnerable to climate change. Within the same framework, when assessing the overall knowledge of nurses about climate change, our findings underscore that nearly two-thirds of the nurses at Al Azhar hospitals demonstrated a good knowledge. This heightened awareness among Al Azhar hospital nurses may be attributed to the susceptibility of the Cairo zone to climate change and its associated uncertainties. This discovery aligns with the findings of Felicilda-Reynaldo et al.[19] who reported that over half of their studied nurses exhibited moderate knowledge about climate change. In contrast, over two-fifths of the nurses at Beni-Suef hospitals exhibited a need for better knowledge, possibly indicating a requirement for continuous education and training on climate change. These results are consistent with a study by Iira et al.[38] highlighting insufficient knowledge among the subjects regarding climate change. A particularly intriguing and pivotal discovery in this study is that over one-quarter of the nurses at Al Azhar hospitals demonstrated excellent overall skills in addressing climate change. This result supports the theory that highly qualified and proficient nurses play a crucial role in the success of providing healthcare to children. This outcome mirrors the findings of Alvarez-Garcia et al.[35] who observed high skills among their study sample. In contrast, more than half of the nurses at Beni-Suef hospitals exhibited poor levels of overall skills in addressing climate change, potentially linked to lower academic backgrounds. This finding aligns with Kalogirou et al.[39] who reported a lack of understanding of the responsibilities and skills needed to address climate change among nurses. In opposition, Anaker et al.[40] found that over half of their study sample possessed good skills. Another critical finding in this study is that over three-quarters of the nurses at Al Azhar hospitals held positive attitudes toward climate change. This could be attributed to African countries experiencing larger climate change consequences, increasing nurses' awareness of its implications and influencing their knowledge, skills, and attitudes. The presence of environmental laws as a crucial component of the nation's development goals may also contribute to these positive attitudes. This finding parallels the results of Xiao et al.[28] who noted that most nurses in their study had a positive attitude toward climate change. Conversely, over half of the nurses at Beni-Suef hospitals displayed a negative attitude toward climate change. The authors posit that this may be due to Beni-Suef being a minor deserting governorate, not a coastal one, with a small population, leading nurses to perceive climate change as irrelevant to their lives. Additionally, nurses graduating from Beni-Suef University may not have been exposed to topics related to climate change in their curriculum, discouraging them from adopting sustainable healthcare practices. These results differ from those of Kircher et al.[41] who reported that two-thirds of their survey participants held a favorable attitude toward climate change. According to the current study, there is a statistically significant relationship between nurses' overall total knowledge, skills, and attitudes, and their age, education, experience, and training courses, with a P value of 0,001. These results align with those of La Torre et al.[1] who noted a significant relationship between age and total knowledge. In this study, a

strong, significant correlation (P value of 0,001) was observed between nurses' overall knowledge, practice, and attitude, potentially linked to nurses possessing the necessary knowledge for higher professional practice. Alvarez-Garcia et al.[6] confirmed this result, while Polivka et al.[37] discovered that the knowledge and attitude of nurses did not have a statistically significant relationship. This research is significant as the first in Egypt to exclusively focus on pediatric nurses and explore their role in addressing climate change, distinguishing it from prior studies that included a mix of nurses.

Practical Implications and Recommendations

This study enhances our understanding of the role nurses play in mitigating the adverse impacts of climate change on children. The research suggests that enhancing awareness among pediatric nurses about climate change through in-service training programs is crucial. There is a need to integrate a green nursing curriculum for undergraduate students and update it in post-graduate programs to better prepare graduates for the increasing incentives and challenges associated with addressing climate change and employing adaptation strategies in nursing. Additionally, establishing guidelines for nurses to adopt sustainable practices in their work, implementing legislation to reduce healthcare waste and ensure proper waste management, and creating incentives for nurses to incorporate environmentally friendly medical procedures in their interventions are highly recommended. Establishing green teams in healthcare settings that promote environmental sustainability and emphasizing nurses' awareness through programs and education is also important.

CONCLUSIONS

Our findings concludes that 69,6 % of the studied nurses at Al Azhar hospitals demonstrated a good level of knowledge, whereas 48,2 % of those at Beni-Suef hospitals exhibited a poor level of knowledge regarding climate change. Correspondingly, at Al Azhar hospitals, 29,2 % of nurses had excellent skills, while 50,6 % at Beni-Suef hospitals possessed poor skills regarding climate change. Besides, a total of 82,1 % of the studied nurses at Al Azhar hospitals expressed a positive attitude, while 54,2 % at Beni-Suef hospitals had negative attitudes regarding climate change.

BIBLIOGRAPHIC REFERENCES

1. La Torre G, De Paula Baer A, Sestili C, Cocchiara RA, Barbato D, Mannocci A, et al. Knowledge and perception about climate change among healthcare professionals and students: A cross-sectional study. South Eastern European Journal of Public Health. 2020;13(March):1-19. doi: 10.4119/seejph-3347.

2. Yang L, Liao W, Liu C, Zhang N, Zhong S, Huang C. Associations between Knowledge of the Causes and Perceived Impacts of Climate Change: A Cross-Sectional Survey of Medical, Public Health and Nursing Students in Universities in China. Int J Environ Res Public Health. 2018;15(12):1-14. doi: 10.3390/ijerph15122650.

3. International Council of Nurses: Nurses, climate change and health Nurses. Geneva, Switzerland https://www.icn.ch/sites/default/files/inline-files/ICN%20PS%20Nurses%252c%20climate%20change%20and%20health%20FINAL%20.pdf (2018). Accessed 30 Dec, 2023.

4. Sambath V, Narayan S, Kumar P, Kumar P, Pradyumna A. Knowledge, attitudes and practices related to climate change and its health aspects among the healthcare workforce in India – A cross-sectional study. The Journal of Climate Change and Health. 2022;6:100147. doi: 10.1016/j.joclim.2022.100147.

5. Sanson AV, Malca KP, Hoorn JV, Burke S. Children and Climate Change. 2022.

6. Alvarez-Garcia C, Alvarez-Nieto C, Pancorbo-Hidalgo PL, Sanz-Martos S, Lopez-Medina IM. Student nurses' knowledge and skills of children's environmental health: Instrument development and psychometric analysis using item response theory. Nurse Educ Today. 2018;69(May):113-9. doi: 10.1016/j.nedt.2018.07.008.

7. UNICEF. The climate crisis is a childs rights crisis. 2021.

8. Ianas. Taking action against climate change will benefit health and advance health equity in the Americas. 2022.

9. Wuebbles DJAKP, Lemke AM. An assessment Of the impact of climate change in illinois. Illinois Environmental Protection Agency, The Nature Conservancy, Illinois. 2021: https://doi.org/10.13012/B2IDB-1260194_V1

10. Hathaway J, Maibach EW. Health Implications of Climate Change: a Review of the Literature About the Perception of the Public and Health Professionals. Current environmental health reports. 2018;5(1):197-204. doi: 10.1007/s40572-018-0190-3.

11. Sulistyawati S, Mulasari SA, Sukesi TW, On AR, Impacts THE, Climate OF, et al. Health impacts of climate change : Adaptation strategies for Western Australia. Tanzania Journal of Health Research. 2012;2018(1):1-16.

12. Bachelet M. Human Rights Council Panel on the adverse effects of climate change on the human rights of people in vulnerable situations. United Nations Human rights Office of the HIigh Commissioner for Human Rights. 2022: https://www.ohchr.org/en/statements/2022/06/human

13. World Health Organization. Public health and climate change adaptation policies in the European Union: final report. WHO press. 2018.

14. Frumkin H. Healthy Environments for Healthy Children: Global Programe Framework. The SAGE Handbook of Environment and Society. 2021:362-73.

15. Nigatu AS, Asamoah BO, Kloos H. Knowledge and perceptions about the health impact of climate change among health sciences students in Ethiopia: a cross-sectional study. BMC Public Health. 2014;14(1):587. doi: 10.1186/1471-2458-14-587.

16. The Centers for Disease Control and Prevention. How Climate Affects Community Health. 2022(1-15):CDC.gov/climate and health-CDC.gov/climate and health.

17. Calabro R. Climate Change and Health Program Needs Assessment Summary. Rhode Island Department of Health Climate Change and Health Program. 2021(July):3-56.

18. World Health Organization: Climate Changes. https://www.who.int/health-topics/climate-change#tab=tab_1 (2022)

19. Felicilda-Reynaldo RFD, Cruz JP, Alshammari F, Obaid KB, Rady H, Qtait M, et al. Knowledge of and attitudes toward climate change and its effects on health among nursing students: A multi-Arab country study. Nursing Forum. 2018;53(2):179-89. doi: 10.1111/nuf.12240.

20. The World Bank Group. Climate-Smart Healthcare: Low-Carbon and Resilience Strategies for the Health Sector. International Bank for Reconstruction and Development/The World Bank. 2017(Washington DC):1-80. doi: 10.1596/27809.

21. Vold WML. Climate Change and Health. Canadian Federation of Nurses Unions. 2019(www.nursesunions.ca):1-52.

22. Ministry of Planning and Economic Development in Egypt. Egypt Human Development Report 2021 Development, a right for all: Egypt's pathways and prospects. 2021.

23. Ministry of Environment & Arab Republic of Egypt. Egypt National Climate Change Strategy 2050. 2022:57-
.

24. Central Agency for Public Mobilization and Statistics. Annual statistical reports. CAPMAS, Cairo, Egypt. 2022.

25. United Nations, World Health Organzation. Climate and health Country Profile – 2015- EGYPT. 2015; Geneva(Switzerland): http://www.who.int/globalchange/en/

26. United Nations Development Programme. Human Development Report 2021. 2021.

27. Anderko L, Schenk E, Huffling K, Chalupka S. Climate Change , Health , and Nursing : A Call to Action. Alliance of Nurses for Healthy Environments. 2016.

28. Xiao J, Fan W, Deng Y, Li S, Yan P. Nurses' knowledge and attitudes regarding potential impacts of climate change on public health in central of China. International Journal of Nursing Sciences. 2016;3(2):158-61. doi: 10.1016/j.ijnss.2016.04.002.

29. Byron L, Akerlof KL. Climate and health concerns of Montana's public and environmental health professionals: a cross-sectional study. BMC Public Health. 2021;21(1):1778. doi: 10.1186/s12889-021-11737-1.

30. Kurt Y, Ozkan CG, Ozturk H. Nursing students' classroom climate perceptions: A longitudinal study. Nurse Education Today. 2022;111:105311. doi: 10.1016/j.nedt.2022.105311.

31. Alliance of Nurses for Healthy Environments. Advancing Clean Air , Climate , Health : Opportunities for Nurses. 2015.

32. Nicholas PK, Breakey S, Blank P. Roles of Nurse Practitioners: Health Consequences of Climate Change in Vulnerable Older Adults. The Journal for Nurse Practitioners. 2020;16(6):433-7. doi: 10.1016/j.nurpra.2020.03.011.

33. Kutywayo A, Chersich M, Naidoo NP, Scorgie F, Bottoman L, Mullick S. Climate change knowledge, concerns and experiences in secondary school learners in South Africa. Jamba: Journal of Disaster Risk Studies. 2022;14(1):1162. doi: 10.4102/jamba.v14i1.1162.

34. Nurses and Nurse Practitioners of British Columbia. The Role of Nursing in Climate Change Actions for Nurses in a Changing World. 2022(1-5):Available from: nnpbc.com-Available from: nnpbc.com.

35. Alvarez-Garcia C, Alvarez-Nieto C, Sanz-Martos S, Puente-Fernandez D, Lopez-Leiva I, Gutierrez-Puertas L, et al. Undergraduate Nursing Students' Attitudes, Knowledge, and Skills Related to Children's Environmental Health. Journal of Nursing Education. 2019;58(7):401-8. doi: 10.3928/01484834-20190614-04.

36. Deveci SE, Kurt O, Pirinçci E, Oğuzöncül AF. Knowledge and awareness of a medical faculty students in Turkey about global warming, climate change and their consequences<p> Türkiye'de bir tıp fakültesi **öğrencilerinin** küresel **ısınma**, iklim değişikliği ve sonuçları ile ilgili bilgi durumları ve farkındalıkları. Journal of Human Sciences. 2019;16(2):679-89. doi: 10.14687/jhs.v16i2.5587.

37. Polivka BJ, Chaudry RV, Mac Crawford J. Public health nurses' knowledge and attitudes regarding climate change. Environmental Health Perspectives. 2012;120(3):321-5. doi: 10.1289/ehp.1104025.

38. Iira T, Ruth ML, Hannele T, Jouni J, Lauri K. Finnish nurses' perceptions of the health impacts of climate change and their preparation to address those impacts. Nursing Forum. 2021;56(2):365-71. doi: 10.1111/nuf.12540.

39. Kalogirou MR, Dahlke S, Davidson S, Yamamoto S. Nurses' perspectives on climate change, health and nursing practice. Journal of Clinical Nursing. 2020;29(23-24):4759-68. doi: 10.1111/jocn.15519.

40. Anaker A, Spante M, Elf M. Nursing students' perception of climate change and sustainability actions - A mismatched discourse: A qualitative, descriptive exploratory study. Nurse Education Today. 2021;105(June):105028. doi: 10.1016/j.nedt.2021.105028.

41. Kircher M, Doheny B, Raab K, Onello E, Gingerich S, Potter T. Understanding the Knowledge, Attitudes, and Practices of Healthcare Professionals toward Climate Change and Health in Minnesota. Challenges. 2022;13(2):57. doi: 10.3390/challe13020057.

FINANCING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

CONFLICT OF INTEREST

Authors declare that no conflicts of interest.

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